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## Manuscript Details

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### Abstract

**Abstract Objective:** This study aimed to report on the trends in incidence and prevalence rates of diabetes mellitus in Saudi Arabia over the last 25 years (1990 to 2015). **Design:** A descriptive review **Methods:** A systematic search was conducted for English-language, peer reviewed publications of any research design via Medline, EBSCO, PubMed and Scopus from 1990 to 2015. Of 106 articles retrieved, after removal of duplicates and quality appraisal, 8 studies were included in the review and synthesised based on study characteristics, design and findings. **Findings:** Studies originated from Saudi Arabia and applied a variety of research designs and tools to diagnosis diabetes. Of the 8 included studies; three reported type 1 diabetes and five on type 2 diabetes. Overall, findings indicated that the incidence and prevalence rate of diabetes is rising particularly among females, older children/adolescent and in urban areas. **Conclusion:** Further development are required to assess the health intervention, policies, guidelines, self-management programs in Saudi Arabia.

<b>Keywords</b>	Diabetes, Prevalence, Incidence, Saudi Arabia
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# **Cover Letter**

## **Author contributions**

All authors were involved in initial conception of the paper and in the design of the review. All authors contributed to the preparation of the final manuscript. AA, LP, and LG take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

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## **Conflict of interest**

The authors declare that there are no conflicts of interest that are directly relevant to the content of this review.

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## Title Page:

# **Incidence and Prevalence Rates of Diabetes Mellitus in Saudi Arabia: An overview**

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## 1. Introduction

Diabetes Mellitus (DM) is a growing global health concern. In 2000, diabetes affected an estimated 171 million people worldwide; by 2011 this had increased to more than 366 million and numbers are expected to exceed 552 million by 2030 <sup>[1]</sup>. DM is a metabolic disease of multiple aetiologies, characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action or both, and associated with disturbance of carbohydrate, fat and protein metabolism <sup>[2]</sup>. The three common type of diabetes include Type 1 Diabetes Mellitus (T1DM), Type 2 Diabetes Mellitus (T2DM) and Gestational Diabetes Mellitus (GDM) <sup>[3]</sup>. The highest prevalence of diabetes is anticipated to occur in the Middle East and North Africa due to rapid economic development, urbanisation and changes in lifestyle patterns in the region <sup>[1]</sup>.

The Kingdom of Saudi Arabia (KSA) is no exception to this global epidemic <sup>[4]</sup> and diabetes is the most challenging health problem in Saudi Arabia <sup>[5]</sup>. According to a report by the Saudi Arabian Ministry of Health, approximately 0.9 million people were diagnosed with diabetes in 1992, rising to 2.5 million people in 2010, representing a 2.7 times increase in the prevalence rates in less than two decades. In 2015, 4,660,06 patients with diabetes attended the family and medical clinics across Saudi Arabia <sup>[6]</sup>. This increasing burden of diabetes is due to various factors, including a rising obesity rate and an aging population <sup>[7]</sup>. Patients with rather than without diabetes are more likely to be affected by other diseases. Diabetes causes serious complications such as blindness and can lead to amputations <sup>[3]</sup>; the incidence of end stage renal disease is higher <sup>[8]</sup> in this

population, and people with diabetes account for between 24% and 51% of those receiving renal replacement therapy [9]. Compared to the general population, patients with diabetes are two to four times more likely to develop cardiovascular diseases, and two to five times more likely to die from this [10]. In addition to its impact on individuals, diabetes places a significant burden on healthcare services and the community as a whole [11]. Globally, diabetes accounted for 11% of total healthcare expenditure in 2011; in Saudi Arabia, the annual cost of diabetes has been estimated at more than \$0.87 billion [12].

It is essential to understand the epidemiology of diabetes in order to identify public health priorities, generate policy initiatives and evaluate the effect of services in reducing the individual and social burden of diabetes [13]. Although prevalence estimates by countries and regions are provided by the International Diabetes Federation, there are substantial variations in time trends as these estimates are based on imputation [14]. In Saudi Arabia, there is no clear prevalence and incidence estimates for this disease, and to date no systematic review has been conducted of the epidemiology of diabetes in the country. Considering the major socio-economic changes that have occurred in Saudi Arabia during the past a few decades and their marked impact on the lifestyles, eating habits and physical activities of peoples of the region, along with the aging of the population, it is essential to revisit the epidemiology of diabetes [12]. This review has therefore been conducted to report on the trends in incidence and prevalence rates of diabetes mellitus in Saudi Arabia over the last 25 years (1990 to 2015).



## **2. Methods**

### **2.1 Review Design**

This review employed a descriptive design to review and analyse studies reporting the incidence and prevalence rates of diabetes in Saudi Arabia. This approach is also referred to as correlational or observational design. In health studies, this type of design is used to obtain information about naturally occurring health states <sup>[15]</sup>. This descriptive study followed the protocol established for the review of prevalence and incidence studies developed by the Joanna Briggs Institute (JBI) (2014), including search strategy, quality appraisal, data extraction and synthesis, results, discussion and conclusion.

### **2.2 Search Strategy**

A systematic literature search was performed to identify publications reporting the incidence and prevalence rates of diabetes in Saudi Arabia. We included publications that focused specifically on studies describing the incidence and prevalence rates of diabetes, or an equivalent and explicit blood glucose-level criteria for diagnosis of diabetes. Studies considering type 1 or type 2 diabetes, or both, were included as these account for over 90% of all diabetes <sup>[16]</sup>. Medical Subject Heading terms (MeSH) were used, including prevalence, incidence, diabetes mellitus, and Saudi Arabia. Synonyms for the identified concepts were generated including, "epidemiology" and "trend"; "type 1 diabetes" and "type 2 diabetes". These concepts were combined using Boolean Operators (AND, OR). Four academic databases (Medline, EBSCO, PubMed and Scopus) were searched for relevant literature. The search was limited to English language papers published over the last 25 years. Papers published in languages other than English and publication types other than primary studies, such as systematic reviews and meta-

analyses, discussion papers, conference abstracts and dissertations, were excluded. In total, 106 citations of potential relevance were identified (**Table 1**). Initial screening of titles and abstracts revealed that 90% of these retrieved studies did not meet the review inclusion criteria, and 16 papers were retained for full-text evaluation. Full text screening for relevance resulted in the exclusion of five further papers. One article was added from the reference lists of the reviewed articles.

### **2.3 Quality appraisal**

These 12 articles were critically appraised for quality using the JBI Critical Appraisal Checklist for studies reporting prevalence data <sup>[15]</sup>. The process resulted in the exclusion of four papers due to low methodological rigor (**Table 2; Figure 1**). The remaining eight studies employed appropriate quantitative designs for incidence and prevalence studies (**Table 3**).

### **2.4 Data extraction**

Data were extracted using a specifically designed data extraction table (**Table 4**), and examined, compared, discussed and agreed with the other authors. Data were analysed descriptively, comparing and contrasting results across studies, taking into consideration the differences in date of study, sampling technique and size, age, setting, methods and type of diabetes.

### **2.5 Data synthesis**

Multiple sources of heterogeneity (region, types of diabetes, age groups and research sites) were observed across the included studies. The heterogeneity was explored

qualitatively by comparing the characteristics of the included studies. Studies were grouped according to the main component of the type of diabetes (**Table 5**).

### **3. Findings**

Of the eight included studies, two examined incidence rates and one reported the prevalence rates of T1DM among children and adolescents, while five studies reported the prevalence rate of T2DM among adults. The studies included only Saudi nationals, with sample sizes ranging from 419 to 45,682. Three studies were conducted nationwide [17, 18, 19], one study was conducted in Dhahran (Eastern region) [20]; one recruited across the entire Eastern province [21], and one each were conducted in Riyadh (Central region) [22], Jeddah (Western region) [23] and Al-Madina (Western region) [24]. Four were conducted using random sampling techniques, two used convenience sampling, and the remaining two did not report the sampling technique used. The research settings of three studies were tertiary hospitals [20, 23, 24], two were set in primary health centres [18, 22], two in households [17, 19] and one was conducted in a range of settings including government and ministry of health hospitals and primary health centres [21]. The reported prevalence and incidence rates of diabetes varied widely across different geographical areas (**Tables 4 and 5**).

#### **3.1 Type 1 diabetes**

Two studies reported the incidence rates of T1DM between 1990 and 2009 in Dhahran, Eastern KSA [20] and in Al Madina, North West KSA [24]. The samples in these two studies were children and adolescents from 0 to 14 years old. The cumulative incidence

rates of T1DM among these children and adolescents were very similar, at 27.52 per 100,000 and 26.7 per 100,000, respectively (**Table 4**). In the Dhahran study, an increasing trend in childhood and adolescence incidence rate of T1DM from 1990 to 2007 was observed (**Figure 2**). The incidence rate of T1DM doubled among children in less than two decades, from 18.05 per 100,000 children between 1990 and 1998 to 36.99 per 100,000 children between 1999 and 2007, indicating an average annual increase in incidence of 16.8% <sup>[20]</sup>. No significant increase in the overall annual incidence rate from 2004 to 2009 in Al-Madina was observed <sup>[24]</sup>; children aged 0 to 4 years had an estimated incidence rate of 17.1 per 100,000, while children aged 5 to 9 and 10 to 12 years had incidence rates of 30.9 and 46.5 per 100,000, respectively. Children aged 5 to 9, and 10 to 12 years had 1.8 and 2.7 times greater risk of developing T1DM than children aged 0 to 4 years <sup>[24]</sup>.

A nationwide study reported the prevalence of T1DM among children and adolescents aged up to 19 years at 109.5 per 100,000 between 2001 and 2007 <sup>[17]</sup>. The highest prevalence rate (126 per 100,000) was recorded in the central region where the capital city of Riyadh is located and the environment is mostly urban; the lowest prevalence rate (48 per 100,000) was reported in the eastern region of KSA, which is predominantly rural <sup>[17]</sup>. The prevalence rate was highest among adolescents aged 13 to 16 years (at 243 per 100,000) and lowest among children aged 5 to 6 years at 100 per 100,000 (Al-Herbish et al., 2008). In terms of gender, the incidence of T1DM was significantly higher among females (at 31.17 per 100,000) than males (at 24.07 per 100,000) in Dhahran, KSA between 1990 and 2007 <sup>[20]</sup>. Similarly, females had significantly higher incidence rates

than males (at 33.0 per 100,000 compared to 22.2 per 100,000 respectively) in Al-Madina, from 2004 to 2009 [24]. In females the highest incidence rate was reported for those aged 7-11 years and in males this was similar for those aged 8-12 years [20]

### **3.2 Type 2 diabetes**

The prevalence rates of T2DM were reported in five studies, two of which were nationwide [18, 19]. Of the other, one study was conducted in Riyadh [22], one in Jeddah [23] and one in the Eastern province [21]. All these studies reported the prevalence of T2DM in different years between 1995 and 2011 and included only Saudi nationals aged between 7 and 80 years (**Table 4**). The studies demonstrated varying prevalence rates in different geographical regions in the country, ranging from 18.2% (in 2004-2005) in the study conducted in the Eastern province [21] to 31.6% in 2011 in the study conducted in Riyadh [22], with a nationwide prevalence rate of 25.4% in 2007-2009 [19]. When plotted figuratively, these five studies indicate a clear trend of overall increasing prevalence of T2DM with time (**Figure 3**). Four studies reported a significantly higher prevalence of T2DM in males than in females; the study conducted in the Eastern province between 2004 and 2005, was the only one to report a significantly higher prevalence of T2DM among females than males but it recruited by convenience rather than random sampling [21]. Of the studies, which recruited using probability sampling (and for one of the two studies that used convenience sampling), there was an increasing prevalence of T2DM for both genders between 1995 and 2011, with higher prevalence rates among males than females (**Figure 3**). Furthermore, T2DM was reportedly more prevalent among people in urban areas (at 25.5% compared to 19.5%, in rural areas) and prevalence rates were

highest in the northern region (at 27.9%) and lowest in the southern region (at 18.2%) from 1995-2000 <sup>[18]</sup>.

Similar findings were reported from the years 2007 to 2009, where prevalence was higher among those in urban areas with monthly incomes of less than 4,000 Saudi Riyal (SR; approx. 1,067 USD) (27.2%) than those in rural areas (25.7%) with similar incomes. Similarly, the prevalence rate was also higher in urban areas (25.6%) than rural areas (22.3%) among Saudis with monthly incomes ranging from 4,000SR (approx. 1,067 USD) to 8,000SR (approx. 2,134 USD). However, no significant difference was reported among those with a monthly income of 8,000SR (approx. 2,134 USD) and higher <sup>[19]</sup>. Other differences noted included the mean age of diagnosis of the disease, reported as 53.4 years for females and 57.5 years for males <sup>[23]</sup>. In geographical terms, T2DM was most prevalent in the northern regions and least in the southern regions between 1995 and 2000 <sup>[18]</sup>. In terms of socio-demographic characteristics, in the Eastern Province the prevalence of T2DM was higher in individuals who were widowed (39.1%), unemployed (31.9%), uneducated (32.3%), or had monthly incomes less than 2000SR (approx. 533 USD; 24.1%) between 2004 and 2005 <sup>[21]</sup>.

#### **4. Discussion**

The findings of this review indicate that diabetes mellitus is a continuing and growing health problem in Saudi Arabia. The findings broadly reflect high incidence rates of T1DM across the country, with T1DM especially rising among children. One study conducted in the western region showed no increase in T1DM for the 5-year period from

2004 to 2009, but this may be due to the study's limitation of including children only up to 12 years of age [24]. Other studies indicate a significant increase in incidence rates of T1DM amongst groups older than 12 years [17, 20]. This review's findings concur with and expand on those of a report by the Saudi Arabian Ministry of Health [20] as well as the latest report of the International Diabetes Federation (2015). The findings are also broadly consistent with epidemiological studies from several areas of Asia, Europe and North America, where the annual growth T1DM has been reported to be 4.0%, 3.2% and 5.3% respectively [25]. The latest report by the International Diabetes Federation cites 16,100 children aged 0-14 living with T1DM in Saudi Arabia, with an incidence rate of 31.4 new cases per 100,000 population [1]. The national incidence rate is higher than the incidence rate in Dhahran [20] and al-Medina [24], reported in this review, which were 27.52 per 100,000 and 26.7 per 100,000, respectively. This implies an increase in new cases of T1DM in the country. Studies included in this review recorded a higher incidence of T1DM among females than males. The International Diabetes Federation reported that the highest incidence rate of diabetes should be expected among females rather than males by 2030 [1]. The reason for this is uncertain, although some suggest the gender differences have to do with environmental and culture. Generally, it is assumed that genetic factors play a major role in the development of T1DM [26].

In contradiction of this reported higher incidence among females, Cucca et al. [27] found a greater genetic predisposition among male populations. This seems to relate to the higher incidence rates of T1DM among the male populations in European countries, but this is not the case in non-European countries like Saudi Arabia [28]. Regardless of the gender

differences, the high rates of T1DM among children in Saudi Arabia are likely to increase burden on the health care system of the country, as T1DM is implicated in the development of a wide range of end-organ complications and more recently, has also been associated with the development of obesity and overweight in early adulthood [29], which is another independent risk factor health for problems such as cardiovascular disease and cancers. Similarly, a steady rise was noted in the prevalence rates of T2DM especially during the years 2004-2005 and up to 2011, affecting both genders. This finding is widely supported by many research studies conducted in Saudi Arabia and other Arabian countries [30]. An alarming increase from 10.6% in 1989 to 32.1% in 2009 was documented in a systematic study conducted among the population of Saudi Arabia (although some of those included in the review were non-Saudis) [30]. Increased obesity, the popularity of fast foods, smoking, and sedentary lifestyles may explain recent increases in the prevalence of T2DM; the incidence of obesity, for instance, has been reported to be as high as 75% among females living in Saudi Arabia [31]. The higher prevalence of diabetes in urban areas, where lifestyle changes are more prominent, lends support to the link between diabetes and life style risk factors.

Prevalence rates of T2DM were found to be higher among males than females although the age of onset was earlier among female than males (at 53.4 years and 57.5 years; [23]. This finding is contrary to a study of Saudi adult patients at a primary health care centre, which reported a higher incidence among females (58%) than males (42%), but this discrepancy may be related to the well-recognised greater willingness of female than males to consult health care practitioners. Moreover, females with diabetes tend to



comply more readily to diet, exercise, blood-glucose testing, medication and foot care than males, according to a study conducted among Saudi nationals in Riyadh, Saudi Arabia [32]. These findings call for prompt attention by the Ministry of Health especially because the heaviest burden of diabetes (of both type 1 and type 2) is its potential to progress to serious complications [33]. Awareness campaigns are viewed as the best option to at least initiate recognition of the need to modify unhealthy lifestyles, but campaigns launched in Saudi Arabia have not been successful so far [30]. Government-supported interventions are required to provide programs aimed at both preventing the development of diabetes and promoting self-care and management of the disease. The findings of this review highlight the importance of introducing measures into the Saudi health care system to update the knowledge and skills of all the health care professionals involved with diabetes management to provide high quality diabetes care [30]. This is particularly important giving the knowledge deficits reported in the nursing workforce both internationally and in Saudi Arabia [34, 35]

#### **4.1 Limitations of this review**

Several limitations must be noted. First, this review was limited to T1DM and T2DM; it did not include the prevalence and incidence rates of gestational diabetes mellitus or childhood/adolescent onset of T2DM. Future reviews should consider each of these types of diabetes. Second, differences in assessment and diagnosis methods for diabetes have resulted in changed diagnosis criteria over time and heterogeneous methods and criteria were observed over time, across regions, and for different types of diabetes in the studies, resulting in some lack of statistical precision.

## **5. Conclusion**

This is the first comprehensive review of the incidence and prevalence rates of T1DM and T2DM in Saudi Arabia. These were found to be high and rising, particularly among women. Females had higher incidence rates of T1DM among children and adolescents than males, and older age groups of children and adolescents had higher incidence rates of T1DM than younger age groups. The incidence rate of T1DM was higher in the central region of the country. The prevalence rate of T2DM is a greater concern among those living in urban than rural areas, but at higher incomes this distinction is lost. This review recommends that urgent attention is required to develop, support and implement health interventions, guidelines and policies nationwide, to assist in the prevention, diagnosis, and management and promotion of self-management diabetes. For the future, well-designed epidemiological studies are required to allow for more accurate and regular monitoring of the incidence and prevalence rates of diabetes across Saudi Arabia.

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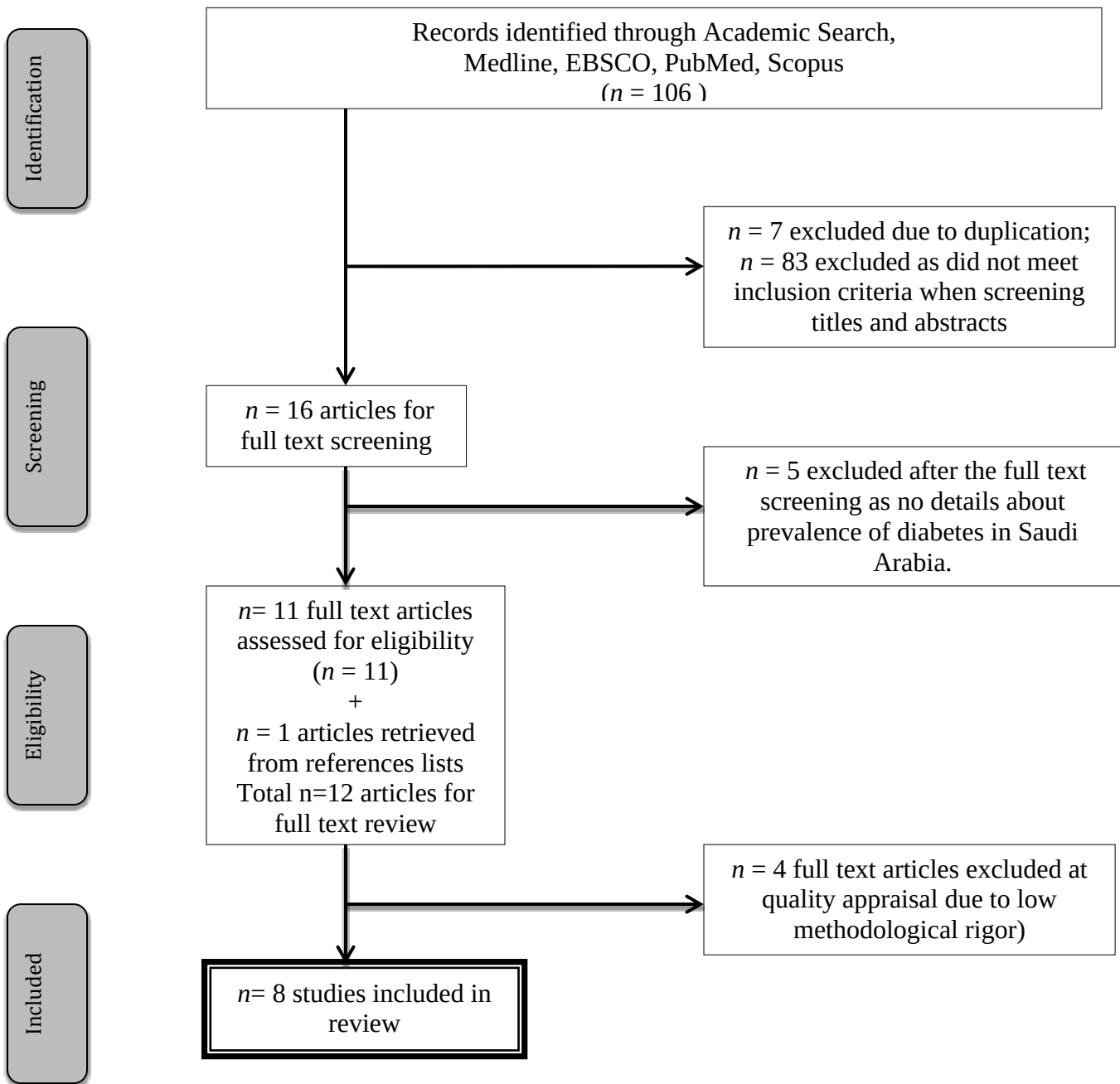
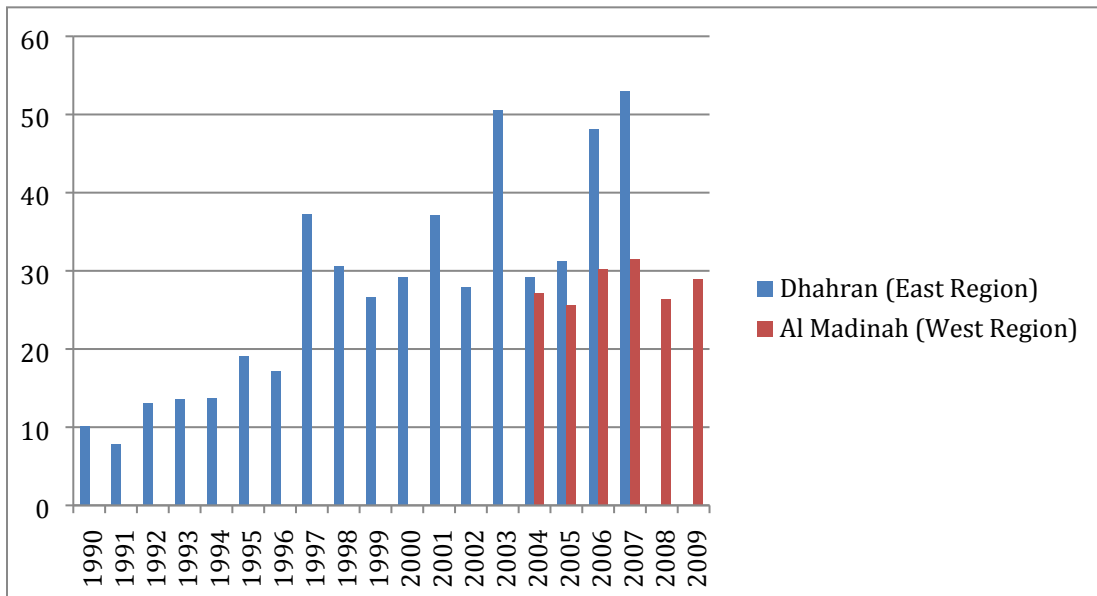


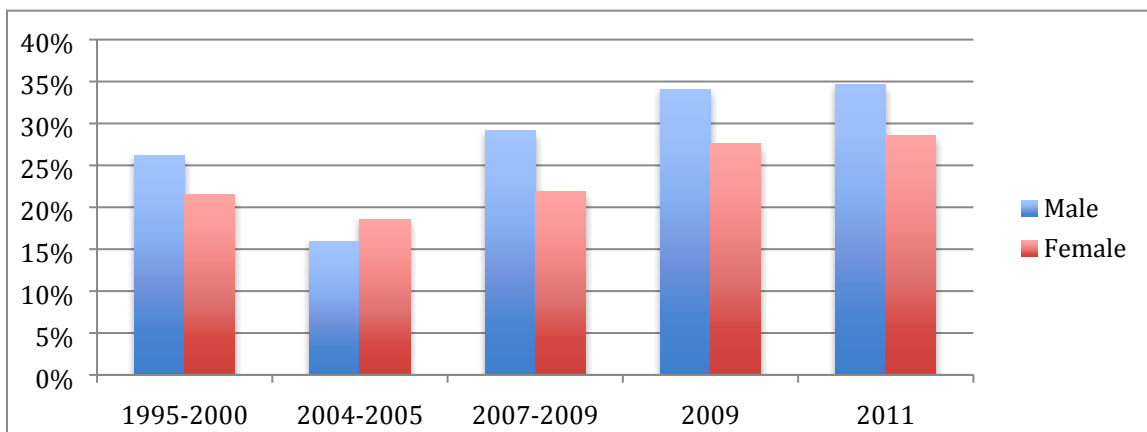
Figure 1: Flowchart of study selection

**Figure 2: Incidence rate of T1DM from 1990 to 2009 in Saudi Arabia**



*Note:* Adapted from (Abduljabbar et al., 2010; Habeb et al., 2011).

**Figure 3: Prevalence rate of Type 2 DM from 1995 to 2011 in Saudi Arabia**



*Note:* Adapted from (Al-Baghli et al., 2010; Al-Daghri et al., 2011; Al-Nozha et al., 2004; Alqurashi et al., 2011; AlRubeaan et al., 2015)



**Table 1: Search terms, database and search output**

<b>Search No</b>	<b>Search Terms</b>	<b>Medline results</b>	<b>EBSCO results</b>	<b>PubMed results</b>	<b>Scopus results</b>	<b>Total</b>
S 1	Prevalence or epidemiology or trend	579,280	1,061,711	2,656,747	2,749,216	7,046,954
S 2	Incidence	229851	249,619	2355894	1,014,650	3,850,014
S 3	Diabetes mellitus	495873	258,094	564756	699,008	2,017,731
S 4	Saudi Arabia	9627	59,039	44900	34,024	147,590
S 5	S1and S2 and S3 and S4 with limits: date (1990-2015), Peer Reviewed, Human, Journal Article and English Language)	12	15	61	18	106

**Table 2: JBI critical appraisal checklist for excluded studies reporting prevalence data**

Author Name/Year	Sample was representative ?	Participants appropriately recruited?	Sample size was adequate?	Study subjects and the setting described?	Data analysis conducted	Objective, standard criteria, reliably used?	Appropriate statistical analysis used	Confounding factors/ subgroups/ differences identified and accounted?	Subpopulations identified using objective criteria
Abou-Gamel et al. (2014)	No	No	No	Unclear	Yes	Yes	Unclear	Unclear	Unclear
Al-Orf (2012)	No	Unclear	No	Unclear	Yes	Yes	Yes	No	Unclear
Alsenany and Al Saif (2015)	Yes	No	No	Unclear	Yes	Unclear	Unclear	Unclear	Yes
Karim et al., (2000)	Yes	No	Yes	No	No	Unclear	Unclear	Unclear	Unclear

**Table 3: JBI critical appraisal checklist for included studies reporting prevalence data**

Author Name/Year	Sample was representative ?	Participants appropriately recruited?	Sample size was adequate?	Study subjects and the setting described?	Data analysis conducted	Objective, standard criteria, reliably used?	Appropriate statistical analysis used	Confounding factors/ subgroups/ differences identified and accounted?	Subpopulations identified using objective criteria
Abduljabbar et al. (2010)	Yes	No	Yes	Yes	Yes	No	Yes	Unclear	No
Al-Baghli et al. (2010)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Al-Daghri et al. (2011)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Al-Herbish et al. (2008)	Yes	Yes	Yes	Yes	No	No	Unclear	Unclear	Unclear
Al-Nozah et al (2004)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear
Al-Qurashi et al. (2011)	Yes	No	Yes	Yes	Yes	Unclear	Yes	Yes	Yes
Al-Rubeaan et al. (2015)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Habeb et al. (2011)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

**Table 4: Summary table of included studies**

Authors (Date of publication)	Date of study	Sample size	Age	Type of diabetes	Sampling technique	Setting (Urban / Rural)	Method used	Incidence / prevalence (per 100,000)		Overall
								Male	Female	
<b>Type 1</b>										
Abduljabbar et al. (2010)	1990-2007	438	<15 years	T1DM <sup>a</sup>	Not reported	Dhahran, Eastern KSA (Urban)	Not mention ed	24.07	31.17	27.52
Al-Herbish et al. (2008)	2001-2007	45, 682	0-19 years	T1DM <sup>a</sup>	Multi-stage stratified random sampling	Nationwide (Rural & Urban)	Self- report	56.9	52.6	109.5
Habeb et al. (2011)	2004-2009	419	0-12 years	T1DM <sup>a</sup>	Not reported	Al-Madinah (Urban)	Self- report	22.2	33.0	27.6
<b>Type 2</b>								<b>Prevalence</b>		
Al-Baghli et al. (2010)	2004-2005	197, 681	≥ 30 years	T2DM <sup>b</sup>	Convenience sampling (approached participants in their workplaces, major public places, malls and other venues)	Eastern Province (Urban & Rural)	CFBG <sup>d</sup> CCBG <sup>e</sup> & FPG	15.9%	18.6%	18.2%
Al-Daghri et al. (2011)	2011	9, 149	7-80 years	T2DM <sup>b</sup>	Cluster random sampling	Riyadh (Unknown)	FPG	34.7%	28.6%	31.6%
Al-Nozha et al. (2004)	1995-2000	16, 917	30-70 years	T2DM <sup>b</sup>	2 stage, stratified cluster sampling	Nationwide (Urban & Rural)	FPG <sup>c</sup>	26.2%	21.5	23.7%
Alqurashi et al. (2011)	2009	6, 024	12-70 years	T2DM <sup>b</sup>	Convenience sampling (patients attending a primary care clinic)	Jeddah (Unknown)	Self- report	34.1%	27.6%	30.0%
Al-Rubeaan et al. (2015)	2007-2009	18, 034	≥ 30 years	T2DM <sup>b</sup>	Random sampling	Nationwide (Urban & Rural)	FPG <sup>c</sup>	29.1%	21.9%	25.4%

**Note.** <sup>a</sup>Type 1 Diabetes Mellitus, <sup>b</sup>Type 2 Diabetes Mellitus, <sup>c</sup>Fasting Plasma Glucose, <sup>d</sup>Capillary Fasting Blood Glucose, <sup>e</sup>Casual Capillary Blood Glucose.

**Table 5: General characteristics of included studies**

<b>Country regions</b>	<b>Central region</b>	<b>East region</b>	<b>West region</b>	<b>Nationwide</b>
	1 study Al-Daghri et al. (2011),	2 study Abduljabbar et al. (2010), Al-Baghli et al. (2010)	2 studies Alqurashi et al. (2011), Habeb et al. (2011)	3 studies Al-Herbish et al. (2008), Al-Rubeaan (2015), Al-Nozha et al., (2004)
<b>Type of diabetes</b>	<b>Type 1 diabetes</b>		<b>Type 2 diabetes</b>	<b>Both types</b>
	3 studies Habeb et al. (2011), Abduljabbar, Aljubeh, Amalraj, and Cherian (2010), Al-Herbish et al. (2008)		5 studies Al-Daghri et al. (2011), Al-Baghli et al., 2010, Al-Nozha, Al-Maatouq, Al-Mazrou, and Al-Harathi (2004), Alqurashi, Aljabri, and Bokhari (2011), AlRubeaan et al., 2015	2 studies Alqurashi et al. (2011), Al-Nozha et al. (2004),
<b>Age groups</b>	<b>Children/ adolescent</b>		<b>Adult</b>	
	3 studies Habeb et al. (2011), Abduljabbar et al. (2010), Al-Herbish et al. (2008)		5 studies Al-Nozha et al. (2004), Alqurashi et al. (2011), Al-Daghri et al. (2011), Al-Baghli et al.(2010), Al-Rubeaan et al. (2015)	
<b>Research setting</b>	<b>Tertiary hospital</b>	<b>Primary healthcare center (PHCC)</b>	<b>Nursing home and households</b>	
	4 studies Alqurashi et al. (2011), Habeb et al. (2011), Abduljabbar et al. (2010), Al-Baghli et al.(2010)	3 studies Al-Nozha et al. (2004), Al-Daghri et al. (2011), Al-Baghli et al.(2010),	2 studies Al-Herbish et al. (2008), Al-Rubeaan et al. (2015),	



## CONFLICT OF INTEREST DECLARATION AND AUTHOR AGREEMENT FORM

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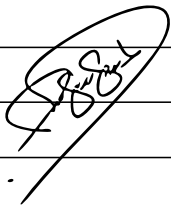
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Alotaibi Abdulallah

- Please check this box if you are submitting this on behalf of all authors.

## **Highlights points**

- Diabetes mellitus is major public health problem.
- The trends in incidence and prevalence rates of diabetes in Saudi Arabia are neglected
- Studies indicated high incidence rates of type 1 diabetes among females and older children/adolescent.
- Studies found high prevalence rate of type 2 diabetes of people living in urban areas.
- This review encourages for further epidemiological studies of the incidence and prevalence rates of diabetes in Saudi Arabia.